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An interesting ordered phase of germanene on Ag(111) with several repeating motifs and a sharp Fourier transform spectrum, and yet no translational symmetry.

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While the family of 2D materials under active study has exploded over the last decade or two (Xenes, TMDs and others) They are usually studied experimentally in their simplest and most pristine (ordered, crystalline) state, which is what theoretical models based on unit cells model (e.g. DFT). But unusual and interesting behaviors can arise in materials which deviate from their perfectly ordered "ideal" forms (e.g. high entropy alloys and quasicrystals).
Here we examine in detail a particularly interesting ordered honeycomb phase of germanene formed on Ag(111) made of a mixture of 5, 6, and 7 sided rings with several repeating local motifs, and surprisingly sharp Fourier transforms which differ for different height cuts, and yet no obvious translational symmetry! We leverage pattern recognition techniques to search a large area, atomic resolution scan to find all instances of each motif and map their distribution.
A final comparison of these results to published, mathematically proven 2D quasicrystals is included.

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